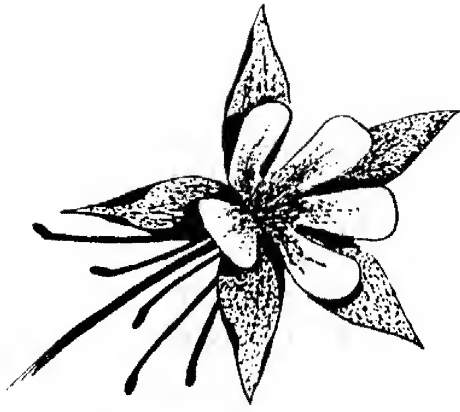


Aquilegia

Newsletter of the Colorado Native Plant Society



"... dedicated to the appreciation and conservation of the Colorado native flora"

Volume 12, Number 6

The Colorado Gentian

Jim Locklear

One of the rarest plants of the Great Plains is a species known only from Colorado. The Colorado gentian (*Frasera coloradensis*) occurs in a restricted area within the counties of Baca, Bent, Las Animas and Prowers in the southeast corner of the state. First collected in 1947, this interesting plant is so poorly known that it escaped mention in the recent (1986) *Flora of the Great Plains*. Harrington, in his *Manual of the Plants of Colorado*, treated this species as *Swertia coloradensis*.

The Colorado gentian is a rosette-forming herbaceous perennial with white-margined, strap-shaped leaves. When not in bloom it resembles the variegated form of spider plant, a familiar house plant. It is showy when in bloom, with a highly branched inflorescence (a corymbose cyme) bearing numerous flowers. The individual flowers are similar to those of monument plant (*Frasera speciosa*), a much taller relative from montane areas to the west, with petals and sepals arranged in fours. The petals themselves are creamy-white with prominent nectaries. Apparently an attractive food source, Colorado gentian plants are centers of considerable insect activity during their mid-June to mid-July blooming season.

Shortgrass prairie is the dominant vegetation throughout the area where the Colorado gentian is found. However, this species only occurs in rocky, exposed areas which typically support communities of low-growing, drought-tolerating plants such as *Astragalus missouriensis*, *Dalea jamesii*, *Eriogonum lachnogynum*, *Hymenoxys acaulis* and *Paronychia sessiliflora*. Outcrops of Greenhorn Limestone appear to be the preferred substrate of the Colorado gentian, although it is also found to a lesser extent on Dakota Sandstone.

One of the most notable aspects of this species is its limited area of distribution. It is presently known only from a rather narrow area that extends from near the little town of Kim in

continued on page 3

November/December 1988

Calendar Overview

Additional information about calendar items will be found throughout this issue.

Winter Workshop Schedule

Dec. 10 Carex Workshop

Leader: Dr. David Cooper

Jan. 14 Presettlement Vegetation

Leader: Dr. Dexter Hess

Feb. 4 High-Altitude Grasses

Leader: Dr. Helen Zeiner

Feb. 25 Keying Composites

Leader: Dr. JoAnn Flock

March 18 Penstemons

Leader: Gwen Kelaidis

April 15 Pollination Ecology

Leader: Dr. Boyce Drummond

Special Field Trip

June 20 - 23 Yampa River Trip

Leader: Tamara Naumann

ANNOUNCEMENTS

Denver Chapter Activities

Tuesday, November 22, 7:30 PM Chapter meeting at Denver Botanic Gardens, Classroom A. Tina Jones will tell us how to attract birds and wildlife to our backyards.

December 28, 7:30 PM Chapter meeting at Denver Botanic Gardens, Classroom A. Potluck and Castlewood Canyon plant preparation. Bring a dish to share and help Ron Abbott and Jeff Uhlich prepare some herbarium sheets.

Meetings for the Denver Chapter take place the 4th Wednesday of each month, unless otherwise indicated (see above). They are located at the Denver Botanic Gardens in Classroom A.

Planet in Peril: Restoring the Balance

Disquieting changes are modifying the earth's air, land and water systems. These changes are disrupting an equilibrium which has existed for millions of years. They appear to stem primarily from the actions of a single species, our own.

Coping with the influence of human activity on the planet is the topic of a conference to be held at the University of Colorado in February of 1989. The conference will address ways in which human-caused disruptions can be slowed enough to restore the healthy functioning of planetary systems; systems on which all life, including ourselves, depends.

The nature of the coming changes and possible responses will be discussed by scientists and policymakers such as Steven Schneider, Noel Brown, Erik Arrenheius, Ralph Cicerone, and Senator Tim Wirth, as well as leaders of national organizations such as World Resources Institute, Environmental Defense Fund, and others. Conference topics include: the greenhouse effect, ozone depletion, energy and the industrial revolution, inequities between nations, local impacts, the role of the private sector, with a strong emphasis on constructive solutions.

Sponsored by the CU Environmental Center, the conference will be held at the University of Colorado in Boulder, CO on February 3rd through 5th, 1989. The conference fee, **not including** a dance and Saturday lunch, is \$18. For more information, contact the CU Environmental Center, Campus Box 207, University of Colorado, Boulder, CO 80309; phone (303)492-8308.

Board of Directors Meeting Minutes October 1, 1988

The meeting of the Colorado Native Plant Society Board of Directors was called to order by President Eleanor Von Bargen at approximately 4:40PM at the home of Tamara Naumann in Boulder. Attending were the President, Eleanor Von Bargen; Vice President, Tamara Naumann; Secretary, Margaret Van Ness; Conservation Chairperson, Sue Martin; Field Trip Chairperson Jeff Dawson; Denver Chapter President, Carol Dawson; Boulder Chapter President, Margie Wortzman; and Directors Velma Richards, Gayle Weinstein, Jim Borland, Elizabeth Otto and Brian Geils. The minutes of the last meeting were approved as corrected. The election of officers for the 1988-1989 term was led by Velma Richards. Eleanor Von Bargen will serve as President; Beth Painter as Vice President; Myrna Steinkamp as Treasurer, and Margaret Van Ness as Secretary.

Eleanor passed out copies of the proposed waiver for field trip participants. She asked that the Board review the waiver and comment on it at the next meeting.

The Federated Garden Club will have a booth, "Everything is Coming up Roses", at the Home and Garden Show and has offered CONPS a chance to have a display at that booth. This and possible CONPS handouts was briefly discussed and will be discussed in more detail at a later meeting.

Richard Brune is interested in producing a brochure on the natural points of interest at Pawnee Grassland and has asked if the Society would contribute \$250 toward its publication. Eleanor will try to get more details on this project.

An impending reservoir north of Kremmling will affect an *Astragalus* and a *Penstemon* species which are of special interest. John Anderson has asked if the Society is interested in sending a representative to the hearing on this reservoir. Carol Dawson is familiar with the plants and will try to attend the hearing [see report, page 4].

The meeting was adjourned at 5:45PM.



Colorado Gentian, continued from page 1

Las Animas Co. northeastward as far as Two Buttes Reservoir on the Prowers/Baca County line. A couple of scattered stations occur near the Carrizo Mesa to the southeast of Kim. Carol Kuhn, formerly of the University of Kansas Herbarium, conducted an extensive search for Colorado gentian in 1987, checking likely areas in Baca, Bent, Las Animas, Otero and Prowers counties. Her work, funded jointly by the Nature Conservancy, Colorado Dept. of Natural Resources and U.S. Forest Service, increased the number of known occurrences from six to 33. All of these occurrences fall into the distribution area described above, which Kuhn observed roughly coincides with the route of the Grenada Santa Fe Trail along the course of Two Buttes Creek.

As Curator of Plants with the Nebraska Statewide Arboretum, I have spent time observing this species in the field and collecting seed for our joint program with the Center for Plant Conservation. I have looked for the Colorado gentian in likely areas near the Black Mesa in the extreme western Oklahoma panhandle and south of the Mesa de Maya in northeastern New Mexico. To date, no locations for this species outside of Colorado have been found.

Why is the limited range of the Colorado gentian of interest? The prairies of the Great Plains are in general comprised of plants with rather broad areas of distribution. Rare species are themselves a rarity in this region, which extends from the foothills of the Rockies eastward into Missouri, Iowa and Minnesota and from the Canadian border south into Texas. The Colorado gentian is notable in that it may have the most limited distribution of any plant endemic to the Great Plains.

Just why this species only occurs where it does is a question that invites further investigation. We hope that anyone who seeks answers here will also consider that its nearest relatives, aside from the previously mentioned *Frasera speciosa*, are found only as near as northwest New Mexico and southwest Colorado. Perhaps at one time there were linking populations between the Colorado gentian and its relatives on the other side of the Rockies that have since faded away. A challenging problem for plant geographers!

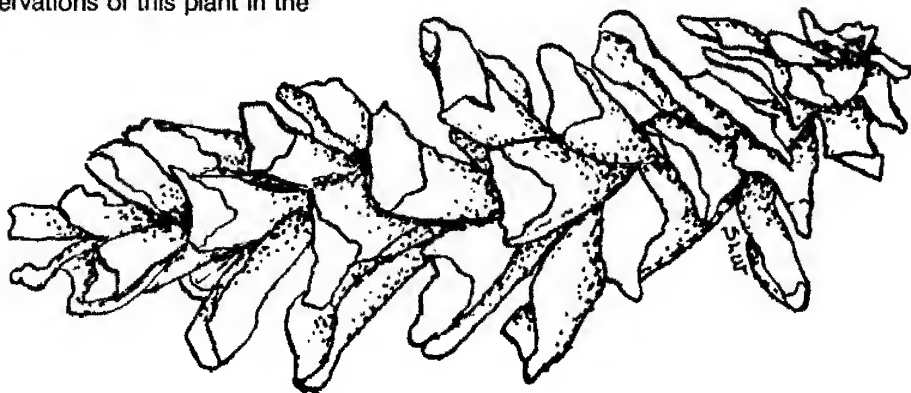
The reproductive biology of this species would also make for interesting study. My observations of this plant in the

field lead me to suspect that it is a monocarpic perennial. Such plants exist in a vegetative (non-flowering) state for a period of time, perhaps years, only to die in the year that they do bloom and produce seed. This pattern has been noted in *Frasera carolinensis*, a species of the eastern U.S., which exists as a rosette for many years before flowering and subsequently dying. I have observed Colorado gentian plants in early September, full of ripe fruit, with yellowing rosettes which appear to be dying.

If this species is a monocarpic perennial, just what stimulates it to flower? Is it the age of the plant or certain environmental stimuli? Does it exhibit the synchronous flowering pattern reported for *Frasera speciosa*, where a total absence of flowering will occur in a colony in some years, followed by abundant flowering in others? Here are opportunities for professional or non-professional botanists, through careful observation, to make valuable contributions to our understanding of a rare species.

How rare is the Colorado gentian? Is it in need of protection? Carol Kuhn's assessment after extensive observation was that, while restricted in distribution, the species is abundant, even prolific, within its range. The most significant threat to the Colorado gentian appears to be grazing by cattle in mid to late summer, when little other forage is available. Based on this, she recommended threatened status and suggested that local ranchers be encouraged to protect areas from grazing occasionally to allow the plants to mature and produce seed. She also noted that the Colorado gentian occurs on state-owned land at the Two Buttes State Wildlife Area and recommended this area as a protected site for the species.

Those wanting to view this plant in the wild would find it most accessible at Two Buttes Reservoir. Look for it in rocky areas on both the north and south sides of the reservoir. Colorado gentian is one of several interesting species from this region of mesas and vast horizons. Other restricted or relatively rare plants from southeastern Colorado include *Asclepias uncialis*, *Astragalus puniceus*, *Haplopappus engelmannii*, *Haplopappus fremontii* ssp. *monocephalus*, *Lesquerella calicicola* and *Oenothera haringtonii*. Perhaps more species await discovery in this beautiful but little-traveled region of the state.



Endangered Species: New Listings

Carol Dawson

Two Colorado plant species from Middle Park have been proposed for federal listing as endangered species. The two species, *Astragalus osterhoutii* (Osterhout milkvetch) and *Penstemon penlandii* (Penland beardtongue), are both restricted to the shale badlands around the town of Kremmling.

The Osterhout milkvetch is a tall bushy *Astragalus* up to 100 cm. high with large white flowers and pendulous pods. It occurs in scattered colonies along Muddy Creek and its tributaries and Troublesome Creek, near the town of Kremmling.

Penland's penstemon is a short plant with linear leaves. Just like the Osterhout milkvetch, it has large showy flowers. The flowers have blue lobes with violet throats. The single population which occurs in the badlands between Troublesome Creek and Sulphur Gulch may contain approximately 5000 plants.

Both of these plant populations are threatened by the proposed Muddy Creek Reservoir. The lower edges of the Osterhout milkvetch population would be inundated by the proposed reservoir. Additional impacts on both species would stem from the recreational use of the reservoir and the surrounding benches. Penland's penstemon would be especially vulnerable to off-road vehicle damage.

The U.S. Fish and Wildlife Service reopened the comment period on these two species until October 24, 1988. A public hearing was also held in Kremmling on October 13th, as requested by the Colorado River Water District and the Grand County Board of Commissioners. I attended and represented the Society and the Center for Plant Conservation* in favor of protection. Even though the hearing was sparsely attended, and other speakers (representing project proponents) opposed designation, it appears the end result will be full protection of both these species.

* For those not familiar with this organization, the Center is a consortium of 19 botanic gardens and arboreta, including DBG, dedicated to bringing rare plants into cultivation before they become critically endangered in the wild. Seeds are placed in storage and grown on a rotating basis to ensure long-term survival of the species.

Edible and Medicinal Plants

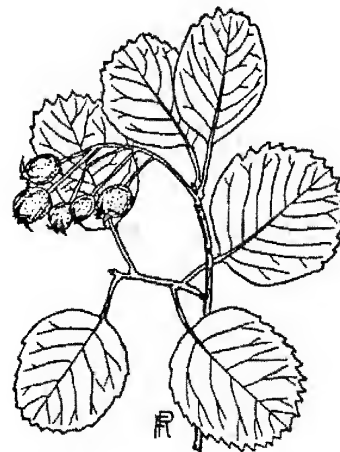
Workshop Report by Becky Varle

This workshop was held on Saturday, Sept. 10 in the Morrison Center at Denver Botanic Gardens. Tina Jones, a member of the CONPS' Board of Directors, led the group. Tina first presented a number of books she recommended that we might wish to read, including *A Practical Guide to Edible and Useful Plants*, by Velena Tull, and *Edible and Useful Wildplants of the Urban West*, by Alan and Sue McPherson.

Next, we were shown slides of many plants while Tina told us how each, or parts of each, could be used and where to find them. She pointed out the dangers of mistaking poisonous for safe plants, poisonous parts of plants for safe parts of the same plant, and how some are safe at certain stages of development and poisonous at other times. We were cautioned as to where it is and isn't legal to gather wild plants, and the importance of not damaging local ecosystems when looking for and gathering wild plants.

Some of the species discussed included purslane (*Portulaca oleracea*), cheeseweed (*Malva neglecta*), amaranth (*Amaranthus retroflexus*), prickly pear cactus (*Opuntia*), curly dock (*Rumex crispus*), common sunflower (*Helianthus annuus*), cow parsnip (*Heracleum sphondylium*), stinging nettle (*Urtica dioica*), broadleaf plantain (*Plantago major*) and yucca (*Yucca glauca*).

Following the slide presentation and lecture, Tina showed us how to prepare some edible plants she had brought along. It was interesting to see the actual preparation of the various plants for eating. Afterward, we feasted on battered milkweed flowers and yucca flowers, Jerusalem artichoke, wild plums, pennycress (*Thlaspi arvense*), prickly pears, sunflower sprouts, boiled cattail roots and shoots, and skunkbush (*Rhus trilobata*) tea. The food was delicious, capping a most rewarding and informative morning. All participants were left eager to go out and start gathering useful plants for themselves.



1989 Yampa River Botanical Expedition



June 20 - 23, 1989 (Tentative)

Tamara Naumann

Mark your calendars and start saving your pennies now for a botanical rafting adventure you'll never forget! Experience the unparalleled beauty and excitement of **Dinosaur National Monument** canyon country while catching glimpses of some of Colorado's rare plants. Tamara Naumann (botanist with the Colorado Natural Areas Program) has proposed a CONPS field trip of unprecedented proportions. Here's the scoop:

WHAT: Four days and three nights on the **Yampa River** with botanical stops and side trips.

WHO: CONPS members, including trip leader Tamara Naumann, and LeGrand Adventures, a professional river guide company. We also have an opportunity to invite the geologist who prepared the geologic map of Dinosaur National Monument as a guest resource person, if there is interest.

COST: The cost is \$320, representing a discount from the regular commercial rate and including delicious meals (prepared by LeGrand Adventures staff), plus all rafting equipment, life jackets, and dry bags (excludes personal camping gear).

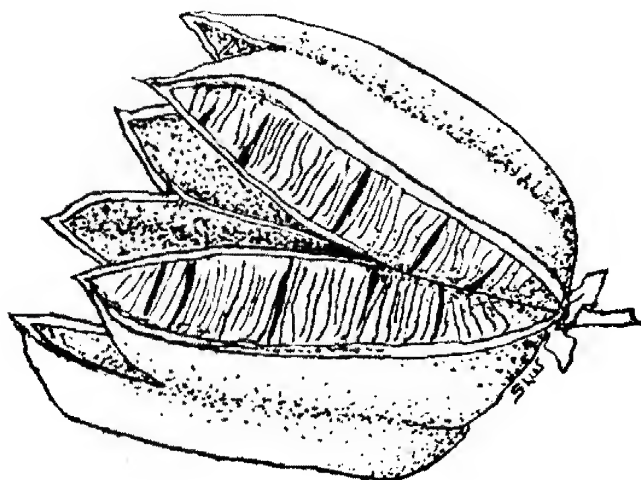
RESERVATIONS: The trip will be limited to 20 participants, so reserve your space now by contacting Tamara Naumann (440-8933, eves.) or Jeff Dawson (722-6758, eves.). A \$100 non-refundable deposit will be required by Feb. 1, 1989. [If you must cancel your reservation, your deposit will be refunded if you find someone to take your place] Payment in full is due one month before the trip. Visa and Mastercard are accepted.

CONDITIONS: The trip will be canceled and deposits refunded if we are unable to rustle up 15 participants by March 15th. Sorry -) children under 10 years of age are not permitted on this trip.



We are hoping that sufficient advance notice will enable CONPS members to plan for a terrific botanical vacation adventure. The advantages of going with a commercial guide company are:

- a guaranteed launch date;
- no menu-planning or food shopping responsibilities (although we may be asked to pitch in with cooking and clean-up);
- the guides are licensed and experienced, and the equipment is taken care of;
- we will essentially have a "private party" trip with emphasis on botanical points of interest.



The botanical treasures of the Yampa Canyon are the highlight of the expedition. Natural Areas Program botanists have conducted floristic inventories in Dinosaur National Monument for the past two field seasons, mapping localities for such rarities as *Epipactis gigantea*, *Cirsium ownbeyi*, *Zigadenus vaginatus*, *Allium nevadense*, *Oenothera acutissima*, *Adiantum capillus-veneris*, and others you have read about here in *Aquilegia*. The 1989 Yampa River Botanical Expedition is an extraordinary opportunity for adventurers with a botanical bent (or botanists with a penchant for thrills). A suggested reading list will be supplied in advance by the trip leader.

Call Tamara if you have questions or want to be talked into it!

About Our Illustrations

Sally White

Suspecting that you may have grown weary of the same illustrations (and noting a dearth of new material being submitted!), we have provided something a bit different this issue and last. The grass illustrations we've been using are xerographic reproductions of actual plant specimens — an easy and inexpensive way to obtain accurate renditions, introduced to me by Julie Duncan. This note is included at the request of Rick Brune to acquaint other CONPS members with a technique accessible to most plant enthusiasts.

Fresh plant specimens may be loosely taped to paper, or simply arranged on a copier plate. Herbarium specimens would undoubtedly work equally well. The original copies of a plant specimen retain an almost photographic three-dimensional quality, with halftones nicely reproduced. Second-generation copies, and subsequent prints such as those in this issue, will appear more like line drawings, having greater contrast as the halftones are lost.

Although this technique can never replace quality scientific illustration, it does offer several advantages. For teachers, field trip leaders, preparers of informal plant guides, xerography provides a quick means to obtain accurate plant illustrations for students. As the actual plant is used, the proportions and field appearance are retained. And of course, it's a fun way to make an identification reference collection, without the need to maintain an entire herbarium. This technique should be readily applicable to other plant groups. Peter Root reports that fern specimens are often photocopied to be mailed to distant experts for verification.

The copied images can also be scanned into computer graphics form. This refinement of the process adds flexibility, but increases expense. This allows the image to be edited, scaled to fit any desired size, placed anywhere on a page, and reused in subsequent documents or for other purposes. The illustration of Switchgrass on this page was produced this way. Some loss of resolution will inevitably occur, depending on the capabilities of scanner and computer, but the result is still an effective illustration. Compare it to the original copy used in the last issue.

If you experiment with this technique using other plants, or develop additional variations, please let us know your results. Other botanists will be interested, and we can report in future issues of *Aquilegia*. If you send us copies of your successes, we'll use them in future issues. Need we add, we still welcome original drawings of interesting plants (or anything!) for publication.



Switchgrass

Panicum virgatum

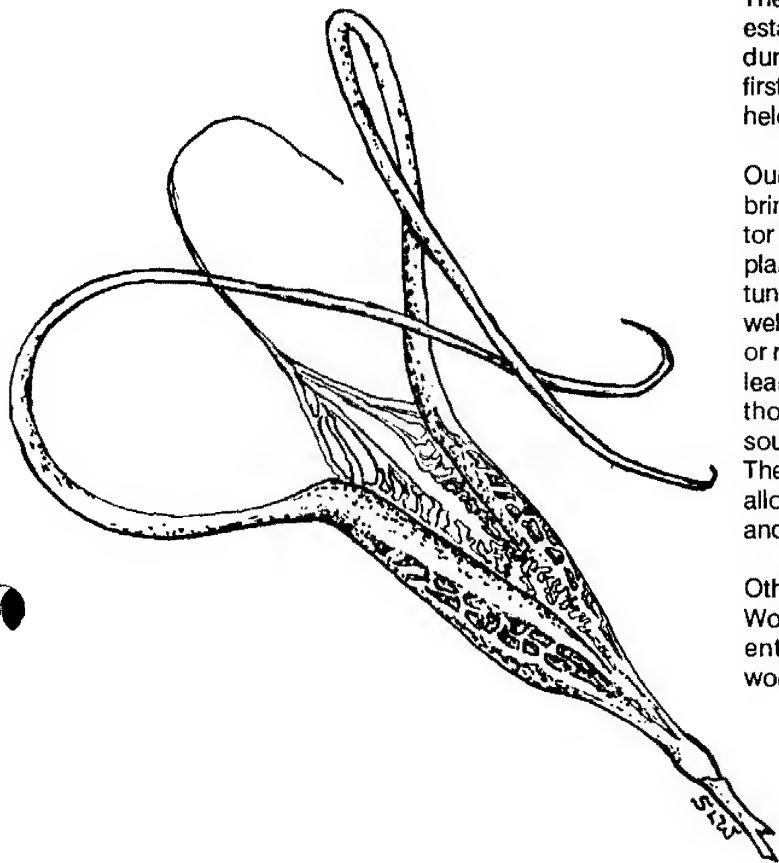
About CONPS Workshops

Bill Jennings

The Colorado Native Plant Society workshop series was established with the objective of having something to do during the winter when field trips are impossible. Since the first workshop in January 1985, twenty-seven have been held.

Our concept of a workshop for plant identification means bringing together plant lovers and a well-informed instructor who has photographs, herbarium specimens and live plants for the attendees to study hands-on, with opportunities for one-on-one interaction with the instructor as well as lectures to the group as a whole. No special skills or requirements, other than a love of plants and a desire to learn, are necessary for attending a workshop. Even though the descriptions may make these workshops sound highly technical, the case is exactly the opposite. The objective is to demystify plant identification and to allow the confused but sincere plant lover to better enjoy and understand native plants.

Other workshops, such as our Presettlement Vegetation Workshop in January, are of more general interest to plant enthusiasts. A schedule and description of winter workshops for this year appears on the following pages.



Registration for Workshops

Enrollment in workshops is always limited, usually due to room constraints, so you must register in advance. Contact CONPS workshop coordinator for registration and workshop information: **Bill Jennings, 360 Martin Dr., Boulder, 80303, 494-5159**. Be sure to include your mailing address and phone number if you mail in your registration. Registrants will be notified by mail about two weeks prior to the workshop regarding final location, time, lunch, suggested references, etc. Please register promptly, as workshops tend to fill up fast. However, cancellations sometimes create openings, so you might want to check with Bill up to the night before the workshop if you want to try to register at the last minute.

Unless otherwise noted, the fee for **each** full-day workshop is \$8 for members and \$16 for non-members. If you plan to attend more than one workshop per year as a non-member, it is cheaper to join CONPS as an individual member (\$8 per year) and come to workshops as a member. Please hold payments until the day of the workshop.

It takes considerable time and effort for the instructors to plan and develop workshops and field trips. Please let us know how you like the workshops and field trips offered by CONPS. We need your suggestions for other workshops and trips, as well as your feedback on whether you found them informative and exciting or dull and uninteresting. We need to know whether we are serving you, our members, the way you wish.

CONPS Workshops Winter, 1988-1989

Carex

Saturday, December 10, 1988

Dr. David Cooper

The grasslike monocots (grasses, rushes and sedges) are usually avoided by wildflower lovers because identification is thought to be difficult or because the floral parts are not photogenic. In this workshop, you will have the opportunity to get over your fear of this important genus. We will learn the characteristic features of sedges, key a number of species, and become familiar with the major regional species. To be held at the Colorado School of Mines, Golden.

Pre- and Post-Settlement Vegetation of the Arkansas Valley

Saturday, January 14, 1989

Dr. Dexter W. Hess Fee: \$5 (\$10, nonmembers)

This workshop will detail the problems as well as the enjoyment of searching for clues about the early vegetation (pre-1830) and the changes that have occurred since that time in the lower Arkansas River drainage in Colorado, specifically in the vicinity of Bent's Old Fort National Historic Site near La Junta. Participants will have access to reprints of early records, diaries, travelogues, and government reports; photographs; and herbarium specimens as they attempt to reconstruct the past. This half-day workshop (9AM to 12:30PM) will be held at the Foothills Nature Center in Boulder.



High-Altitude Grasses

Saturday, February 4, 1989

Dr. Helen M. Zeiner Fee: \$5 (\$10, nonmembers)

Grasses are considered by many to be difficult to identify or understand because of the lack of big, showy flowers and because of the specialized terminology necessary for describing the plant parts. At this workshop, Dr. Zeiner will focus on the recognition of the grasses to be found at high altitudes in Colorado, with special emphasis on the Gunnison National Forest area of the western slope, where she has studied the plant life for many years. This half-day workshop (9AM to 12:30PM) will be held at the herbarium, Denver Botanic Gardens.

More Winter Workshops for 1989 . . .

Keying Composites

Saturday, February 25, 1989

Dr. Jo Ann Flock

At last, our first workshop on the daisy family! After attending this workshop, you can finally identify that scraggly yellow composite you found growing at roadside last summer. In this workshop, the use of Dr. William A. Weber's extensive keys to the composites in both the **West Slope Flora** and **Rocky Mountain Flora** will be demonstrated. Usually, only a few features of the composites need be carefully examined to properly identify the plant. What to look for and what these features are called in the keys will be explained. To be held at Foothills Nature Center, Boulder.

Penstemons

Saturday, March 18, 1989

Gwen Kelaidis

The Intermountain region is a major center for *Penstemon* species. Though beautiful and often highly prized for horticultural purposes, the many species of Penstemons represented make identification difficult. The primary purpose of this workshop is to enable the botanist to identify the different **sections** within genus *Penstemon*. Once the characteristics differentiating the sections are understood, keying from there to species is usually straightforward. Location to be announced.

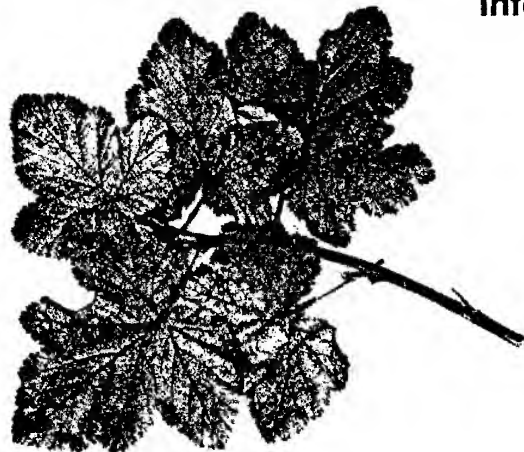
Pollination Ecology

Saturday, April 15, 1989

Dr. Boyce Drummond

Through the use of slides, sketches, plant specimens, and probably some arm-waving, Boyce will cover three basic areas vital to understanding the ways plants reproduce themselves: (1) the structure of the flower and the function of the parts in terms of pollination requirements; (2) the breeding system of plants or modes of pollination (i.e., wind, water, animal); and (3) the evolutionary interaction of plant and pollinator. To be held in Colorado Springs at Warner Center on the Colorado College campus.

NOTE: Please see registration information, page 7.



Shepherdia rotundifolia: The Travails of Getting a Plant to Market

Jim Borland

The Colorado Plateau is rich in potentially excellent plants for the nursery trade. It is here that one can witness the warm desert species invading the cold desert through its numerous deep canyons. If the interest shown by recent CONPS speakers is any indication, there is developing increased awareness of the beauty and versatility of *Shepherdia rotundifolia* (Roundleaf Buffaloberry), a Colorado Plateau endemic. Although not found within the political boundaries of the state of Colorado, this shrub serves as a good example of many Colorado Plateau plants which may find rough going in their introduction into the nursery trade. In fact, this particular species has been introduced and re-introduced into the Colorado nursery trade several times over the past several decades.

The inveterate plantsman George Kelly has been interested in the merits of **Roundleaf Buffaloberry** longer than most of us have been alive, and described it in his book **Shrubs for the Rocky Mountains**. Harry Swift of the now-defunct Western Evergreens nursery in Golden later attempted to introduce *S. rotundifolia* to the trade, apparently without a great deal of success. Contemporary nurserymen have also attempted to make it available to the buying public.

Shepherdia rotundifolia is one of the few native plants known by only one regularly used common name — Roundleaf Buffaloberry. The genus *Shepherdia* was named after English botanist John Shepherd, and the specific epithet aptly describes the shape of the leaves which can vary among oval, orbicular or ovate and range from one-quarter to almost two inches in length. The entire plant has a dense covering of silvery stellate hairs which give it a distinctly shiny appearance unlike any other Colorado Plateau plant. Even the edible fruits are similarly adorned.

The family to which *Shepherdia* belongs (Elaeagnaceae) includes approximately 45 to 50 species worldwide in only three genera (*Elaeagnus* and *Hippophae* are the other two). Two other species of *Shepherdia* [Canada Buffaloberry, *S. canadensis*, and Silver Buffaloberry, *S. argentea*] are native to Colorado and, with *S. rotundifolia*, cover a wide range of elevations and habitats in Colorado, Utah and Arizona.

Most people know Roundleaf Buffaloberry only from the lower elevations of the Colorado Plateau along the southern desert edge of Utah and the Arizona Strip of Northern Arizona. Here it accompanies the Blackbrush (*Coleogyne ramosissima*), Mormon Tea (*Ephedra*), Rabbitbrush (*Chrysothamnus*) and Shadscale (*Atriplex confertifolia*) communities of the low, hot and dry deserts. Roundleaf Buffaloberry is probably best known from along roads and hiking trails in Canyonlands and Capitol Reef National Parks where it is usually found growing on rocky hillsides and at the base of cliffs. Inadequate precipitation

or otherwise unsuitable habitat may be inhibiting its spread into Colorado or even further north along lower elevation courses.

One of the more intriguing features of the species is its habit which includes everything from stiffly upright forms to those which sprawl and occasionally cascade dreamily over boulders. Plants grown from selected individuals would ordinarily be welcomed in the nursery trade and the landscape industry. However, the process from wild plant to landscape plant is often not a simple one, and with Roundleaf Buffaloberry it is an unusually complicated and difficult one.

Propagation from Seeds

Seeds, the most easily transported and stored propagules, have various problems. First, seed from the lower elevation plants can be ready to harvest as early as June or July, a time inappropriate for nursery people to be far away from their places of business. No large nurseries are located close to any of the species' habitats. Because most of the popular locations of the plant are found within the boundaries of either a National Park or National Monument, the simple act of seed collecting becomes complicated by red tape. Another issue which may cause introduction problems is stock plant or seed provenance. Limited observation indicates that plants grown from seed collected at low elevation may not be sufficiently hardy where winter conditions are more severe. Seed production also varies dramatically from year to year. Once the seed gatherer finds an appropriate location, he or she must trust providence that the year produced a bumper crop of fruits. Experience indicates that bumper crops may be produced in some years, and absolutely none in others. Dramatically divergent precipitation patterns and frosts during its flowering season can both adversely affect the species' ability to either flower or fruit.

Unfortunately, there is little or no written information on the germination of seed of this species. My experience with two different seed accessions indicates that one will experience either no difficulty in obtaining germination or that any and all commonly accepted procedures will result in failure.

The seed dormancy mechanism involved here may be after-ripening, one of the simplest known but one of the most frustrating to overcome. In this dormancy, the seed must spend some period of time after removal from the plant before it is capable of germination. In a desert environment, an after-ripening process positions an early-season-produced seed well for utilizing winter moisture.

Travails, continued

Once germination is achieved, the seedling also produces a very long root system which quickly finds the bottom of any commonly used germination container. Here it travels around the bottom creating a mass of roots in the container's most inhospitable environment. Although many of our western dryland species do this, some, including Roundleaf Buffalo-berry, do not tolerate well the lower concentrations of oxygen found in this saturated region of the container. Nurserymen can overcome this condition with several methods. One is to pinch the root upon transplanting into a larger container thereby forcing the taproot to branch and form a larger root system in the upper, more aerated regions of the container.

Another is to use a soil mix whose physical properties provide a higher soil air content than is necessary for most other nursery plants. Open bottom containers filled with soil and placed on an open mesh bench can also be used to allow more oxygen to penetrate the soil through the container bottom and 'air prune' the roots entering this region. Roots pruned in this manner will form many new roots behind the pruning point, thus providing a small plant with more nutrient- and water-absorbing fine roots.

A combination of the use of this type of soil in an open-bottom container can provide all the soil air necessary for good growth of this and other recalcitrant species. Even special attention to watering can help prevent a permanently water-logged layer in the container bottom. Unfortunately, each of these solutions requires special attention or materials which add to the cost of the finished product.

If that were not enough, Roundleaf Buffalo-berry seedlings are slow-growing, often producing only a few leaves the first year, while other common nursery species completely fill out at least a one gallon container. Although close examination of the one year old buffalo-berry's roots would reveal a massive, well formed system, customers do not buy roots. Even after two years' growth, most nursery grown plants would barely qualify as a well-filled one gallon container plant. The above special conditions are more than sufficient to eliminate the species from any nurseryman's list of plants which can be grown for a profit!

Other Propagation Techniques

Propagation through the use of cuttings is not yet a viable alternative. No written information is available on this type of regeneration. Cutting propagation experience with Roundleaf Buffalo-berry's two relatives, Canada and Silver Buffalo-berry, indicates that providing the right conditions for cuttings to root is next to impossible. Hence, both these species are propagated through seed methods, and no select cultivars are available in the trade.

Some promise has been shown, however, in a one-time attempt to root *S. canadensis* cuttings taken in Rocky Moun-

tain National Park after several frosts had occurred. Even without special hormone treatments, over 80% of these cuttings rooted. Probably the main reason that this method and timing had not been tried before is that spring and summer, not fall, is the usual season for taking cuttings of nursery material. Whether or not fall cuttings would work with *S. rotundifolia*, the use of cuttings is further complicated by the special anatomical features of Roundleaf Buffalo-berry. Unlike its two deciduous cousins, this species is evergreen and densely covered with stellate hairs which create special problems in the typical greenhouse or nursery mist propagation bench. Extremely hairy or tomentose cuttings often succumb to fungal rots or are leached of nutrients before they have had sufficient time to root. Those few which may root often perform poorly in the subsequent growth phases.

A method to resolve this may be fog. Special equipment is used to create a true fog which never condenses on the cuttings and thus may prevent the growth of the offending fungi and the lethal nutrient leaching. As if this were not enough, cuttings rooted in the fall are notoriously difficult to keep alive over winter. Temperatures high enough to root cuttings also affect the degree of dormancy of the resulting rooted cuttings. They cannot be directly placed outdoors, and they cannot be placed inside a warm greenhouse for further growth since they are at least partially dormant and must first experience an extended period at temperatures below 45 degrees Fahrenheit. This necessitates the use of some kind of structure which prevents the rooted cuttings from getting too warm or too cold.

Dr. Harrison Hughes at Colorado State University is currently exploring tissue culture methods on our three species of *Shepherdia*. Only time will tell if this method will succeed, or whether it will prove practical, in terms of necessary equipment and personnel, for the nursery industry to produce buffalo-berry in this manner.

Summary

This article attempts to convey the barriers to be overcome in introducing promising native plants to landscape use. Even if the reader is not familiar with nursery plant production, I think he or she would agree that the introduction of this species to the landscape industry is filled with special problems. Any one of them is sufficient to keep it out of the trade — forever. We have nurserymen to meet the challenge. All we need now are customers to meet the costs.



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